

**WHAT IS CLAIMED IS:**

1. A step-down converter for converting a DC input voltage into a DC output voltage, comprising:

a series arm, comprising:

a controlled switch having a self-conducting switching transistor;

an inductance series-connected to the controlled switch;

a first Zener diode; and

a current sensor configured to sense a current flowing through the series arm;

a shunt arm arranged between the controlled switch and the inductance, the shunt arm comprising a freewheeling diode;

a capacitor parallel-connected to the first Zener diode;

a smoothing capacitor arranged at an output of the step-down converter; and

a control circuit having a control transistor, wherein the control transistor is configured to periodically open and close the controlled switch as a function of the current; and

wherein the first Zener diode and the capacitor parallel-connected to the first Zener diode are configured to generate a blocking voltage, which is supplied to the self-conducting switching transistor when the current sensor senses at least a pre-determined maximum value of the current.

2. A step-down converter as claimed in claim 1, further comprising:  
  
a gate-source resistor;  
  
wherein the switching transistor comprises a depletion-FET, and  
  
wherein the gate-source resistor is configured to connect the gate and the source of the depletion-FET to each other.
3. A step-down converter as claimed in claim 2,  
  
wherein the current sensor comprises a sensor-resistor,  
  
wherein a voltage drop occurring on the sensor-resistor is supplied to a base-emitter path of the control transistor; and  
  
wherein the collector of the control transistor is led to the gate of the switching transistor.
4. The step-down converter as claimed in claim 3, wherein the sensor-resistor is arranged in the series arm between the first Zener diode and the inductance .

5. The step-down converter as claimed in claim 2, further comprising:

a discharge transistor;

a discharge resistor; and

a sensor-resistor arranged in the series arm;

wherein a series connection of a collector–emitter path of the discharge transistor and the discharge resistor bridges a gate–source path of the switching transistor; and

wherein a voltage drop on the sensor-resistor is supplied to a base–emitter path of the discharge transistor.

6. A step-down converter as claimed in claim 1, wherein the DC output voltage at the smoothing capacitor is limited by a second Zener diode.